OECD Approval No. 818

Test in accordance with the OECD standard code for the official testing of agricultural tractors

Report on test of Massey-Ferguson 298 Tractor



Manufactured by	Massey-Ferguson Manufacturing Co., Banner Lane, Coventry, Warwicks.
Test No.	R81/2/7541/OECD
Report No.	675
Date	July 1981

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

National Institute of Agricultural Engineering
Wrest Park Silsoe Bedford MK45 4HS

BSRAE Copyright

TABLE OF CONTENTS

		Page No.
SPECIFICATION OF TRACTOR		1
CONDITIONS DURING TEST		8
FUEL AND LUBRICANTS USED IN TESTS		8
COMPULSORY TESTS		
1	Main power take-off performance	9
2	Drawbar performance	13
3	Turning space and turning circle	14
4	Location of centre of gravity	14
5	Braking	14
6	Measurement of external noise level	15
7	Noise measurement at the driver's ear	16
8	Power lift and hydraulic pump performance	16
OPTIONAL TESTS		
9	Performance at engine crankshaft	18
REPAIRS AND ADJUSTMENTS DURING TESTS		22
REMARKS		22

SPECIFICATION OF TRACTOR

Manufacturer's name and address:	Massey-Ferguson Manufacturing Company, Banner Lane, Coventry, Warwickshire.
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the testing station
Place of running-in:	Coventry
Duration of running-in:	50 hours

Tractor:

Make:	Massey-Ferguson
Model:	M-F 298
Type:	Four wheel, rear wheel driven, unit construction
Serial No.:	UKP 81

Engine:

Make:	Perkins
Model:	A4 318
Type:	4-stroke, direct injection diesel
Serial No.:	318 UO 490

Cylinders:

Number and disposition:	4 vertical, in-line
Bore:	114.4 mm (4.5 in)
Stroke:	127.0 mm (5.0 in)
Capacity:	5222 cm^3 (319 in^3)
Compression ratio:	17.5:1 (nominal)
Arrangement of valves:	Overhead
Liners:	Replaceable, dry

Fuel system:

Feed system:	A.C. Delco, mechanical pump with hand primer
Make, type and model of filter(s):	C.A.V., twin paper element in series
Tank capacity:	103 l (22.7 UK gal)
Make, type and model of injection pump:	C.A.V., distributor, DPA 3342 F411
Injection pump Serial No.:	R 47604 YW
Manufacturer's production setting of injection pump:	18.4 l/h (32.4 UK pt/h) to 19.3 l/h (34.0 UK pt/h) at 2000 rev/min engine speed on full load and 63°C (145°F) cambox temperature, using fuel of 0.835 specific gravity at 15°C (59°F)

Fuel system (Cont'd)

Make, type and model of injectors: C.A.V., E.D., BDLL 150S 6599

Injection pressure: 17.73 MPa (175 atm)

Injection pump delivery starts: 16° before T.D.C.

Governor:

Make and type: C.A.V., mechanical incorporated in injection pump

Governed range of engine speed: 700 rev/min to 2200 rev/min

Rated engine speed: 2000 rev/min

Air cleaner:

Make and type: Lautrette, oil bath 200 mm (7.9 in) dia

Model: M-F 1669 838 M91

Oil capacity: 1.0 l (1.8 pt)

Position: Forward of radiator

Pre-cleaner:

Make and type: Lautrette, cyclonic action

Position: Above bonnet on left-hand side

Turbo-charger:

Make and type: None fitted

Lubrication system:

Type of feed and pump: Forced feed from gear pump

Type of filter: Full flow replaceable cartridge

Oil cooler : Mounted above filter

Total oil capacity including filter: 9.5 l (16.7 pt)

Recommended oil: S.A.E. 20 W/30, viscosity 50 cSt at 50°C (122°F)

M.I.L. standard: MIL-L-2104 C

Oil change period: 250 hours

Filter change period: 250 hours

Cooling system:

Coolant: Water

Type of pump: Impeller

Fan diameter: 444 mm (17.5 in)

Number of fan blades: 5

Type of temperature control: Thermostat

Coolant capacity: 16.0 l (28.2 pt)

System pressure: 70 kPa (10 lb/in^2)

Starting system:

Make, type and model: Lucas, solenoid-engaged electric motor, M50G

Starter motor power rating: 2.3 kW (3.1 hp)

Safety features: Operable only when high-low gear selector is in neutral

Cold starting aid: C.A.V. Mk IIIC Thermostart

Exhaust system:

Make and construction: Luchaire and Cie, single chamber

Dimensions of expansion chamber: 190 mm (7.5 in) x 100 mm (3.9 in) oval x 610 mm (24.0 in) long

Position: Vertical on left-hand side

Electrical system

Voltage: 12

Earth polarity: Negative

Make and type of generator: Lucas 16 ACR alternator

Output: 34 A at 6000 rev/min

Make and type of battery: 1 Chloride 353 lead acid

Rating: 128 Ah at 20 hour rating

Transmission

Clutch:

Make and type: Laycock, single plate, dry

Diameter of plate: 330 mm (13.0 in)

Method of operation: Pedal

Gearbox:

Make and type: M-F, constant mesh and epicyclic

Number of speeds: 12 forward and 4 reverse

Arrangement: 3 forward and 1 reverse gear with high-low manual shift and high-low epicyclic range

Rear axle and final drive(s):

Make and type: M-F, crown wheel and pinion, epicyclic reduction gears

Type of differential lock and method of engagement: Self-disengaging, pedal operated

Transmission oils

	Gearbox and rear axle	Final drives
Recommended oil: S.A.E.	20 W/30	90
Capacity:	36.0 l (63.4 pt)	3.1 l (5.5 pt) each
Viscosity at 50°C (122°F)	54 cSt	115 cSt
M.I.L. standard	MIL-L-2104C	MIL-L-2105
Oil change period	500 hours	500 hours
Filter change period	500 hours	

Gear	Number of engine revolutions for one revolution of driving wheel	Nominal travelling speed for 2000 rev/min rated engine speed,* km/h	(mile/h)
Forward			
L1 low	294.79	1.97	(1.22)
L1 high	231.02	2.51	(1.56)
L2 low	196.52	2.95	(1.83)
L2 high	154.01	3.77	(2.34)
L3 low	107.19	5.42	(3.37)
L3 high	84.01	6.91	(4.29)
H1 low	72.06	8.06	(5.01)
H1 high	56.47	10.28	(6.39)
H2 low	48.04	12.09	(7.51)
H2 high	37.65	15.42	(9.58)
H3 low	26.20	22.16	(13.77)
H3 high	20.53	28.28	(17.58)
Reverse			
L low	196.52	2.95	(1.83)
L high	154.01	3.77	(2.34)
H low	48.04	12.09	(7.51)
H high	37.65	15.42	(9.58)

*Calculated with a tyre radius index of 770 mm (30.3 in)

Power take-off

Position: At rear of tractor in vertical centre plane, with interchangeable shaf

Height above ground 540 rev/min: 654 mm (25.7in), 1000 rev/min: 654 mm (25.7 in)

Distance behind rear axle 540 rev/min: 295 mm(11.6in), 1000 rev/min:295 mm(11.6 i

Diameter: 34.9 mm ($1^3/8$ in)

Number of splines 540 rev/min: 6 to I.S.O. standard

1000 rev/min: 21 to I.S.O. standard

Proportional engine speed pto:

Method of engagement: Independent of main clutch, engaged by hand lever and hydraulically operated multi-plate clutch

Speed at rated engine speed: 540 rev/min pto: 640 rev/min
1000 rev/min pto:1182 rev/min

Engine speed at standard pto speed 540 rev/min pto:1686 rev/min
1000 rev/min pto:1692 rev/min

Direction of rotation (viewed facing driving end): Clockwise

Belt pulley

Available, not fitted for test

Power lift

Make and type of pump:	M-F, 4 cylinder piston
Nominal working pressure:	20.7 MPa (3000 lb/in^2)
Pump drive:	From pto drive line
Oil supplied from:	Transmission housing
Type, number and position of external tappings:	None fitted as standard
Oil capacity:	As transmission
Linkage category:	2 with two assistor rams
Controls:	Top link sensing, draught, position and pressure, selective response on drop

Drawbar

Type:	Swinging
Vertical height to centre of clevis:	max. 564 mm (22.2 in), min. 413 mm (16.3 in)
Changed by:	Inverting drawbar and clevis
Distance behind rear axle centre:	537 mm (21.1 in) and 651 mm (25.6 in)
Distance behind pto:	242 mm (9.5 in) and 356 mm (14.0 in)
Lateral adjustment:	218 mm (8.6 in) and 400 mm (15.7 in)
Pivot position relative to rear axle:	130 mm (5.1 in) forward
Drawbar pin hole diameter:	26 mm (1.0 in)
Linkage drawbar available,	not fitted for test

Rear hitch

Automatic pick-up hitch available, not fitted for test

Front hitch

Type and position:	Clevis, incorporated in front weight frame
Height above ground:	695 mm (27.4 in)
Width of clevis:	64 mm (2.5 in)
Diameter of pin hole:	34 mm (1.3 in)

Steering

Make and type:	Danfoss hydrostatic, incorporating manual control for emergency
Make and type of pump:	D.B.A., gear driven
Oil supplied from:	Integral reservoir
Recommended oil:	A.T.F. Dexron 11, Viscosity 26.8 cSt at 50°C (122°F)
Oil change period:	500 hours
Filter change period:	500 hours

Brakes

Make and type of service brakes: Girling, oil immersed multi disc

Position: On differential half shafts

Method of operation: Pedals independent or combined, hydraulic transmission

Type of parking brake: Hand lever with ratchet

Method of operation: Activates both service brakes

Wheels

Steering wheels:

Make and size: Goodyear Super Rib Tractor, 7.50-18

Type: Cross-ply 8-ply rating

Maximum mass on each tyre and pressure: 945 kg (2083 lb) at 370 kPa (54 lb/in^2)

Track width: 1406 mm (55 in) by 102 mm (4 in) steps to 1916mm (75 in)

Changed by: Extending axle

Driving wheels:

Make and size: Goodyear Traction Sure Grip, 18.4/15-34

Type: Cross-ply 8-ply rating, rim size W 14 L

Maximum mass on each tyre and pressure: 2565 kg (5655 lb) at 140 kPa (20 lb/in^2)

Track width: 1420 mm (56 in) by 102 mm (4 in) steps to 2440 mm (96 in)

Changed by: Power shifting and reversing wheels

Wheelbase 2432 mm (95.7 in)

Safety Cab Not fitted for test

Lighting

Unrestricted beam angle of headlight in plan view 144°

	Height above ground of centre, mm	(in)	Size, mm	(in)	Distance from outside edge of tractor at 1726 mm (68.0 in) wheel track, to centre, mm	(in)
Headlights	1000	(39.4)	120 dia	(4.7)	923	(36.3)
Side lights	1710	(67.3)	110 x 40	(4.3) x (1.6)	334	(13.1)
Rear lights	1530	(60.2)	110 x 40	(4.3) x (1.6)	470	(18.5)
Reflectors	1560	(61.4)	75 dia	(3.0)	343	(13.5)

Number of grease points

Whole tractor: 11

Overall dimensions

	Length, m	(in)	Width, max. m	(in)	Width, min. m	(in)	Maximum height to top of exhaust, m	(in)
Without ballast	4.10	(161)	2.90	(114)	1.88	(74)	2.74	(108)
With ballast	4.41	(174)	4.27	(168)	3.25	(128)	2.74	(108)

Minimum ground clearance 390 mm (15.4in) to underside of drawbar frame

Seat

Make and type: Sablé, upholstered pan

Suspension: Coil spring

Damping: Hydraulic

Range of adjustment: longitudinal 164 mm (6.5 in)

vertical 40 mm (1.6 in)

CONDITIONS DURING TEST

Masses

Tractor (without driver but with tanks full)

	Front, kg (lb)	Rear, kg (lb)	Total, kg (lb)
Without ballast	1191 (2626)	2029 (4473)	3220 (7099)
With ballast	1709 (3768)	4299 (9478)	6008 (13245)

Ballast

	Number of weights	Total mass, kg (lb)	Water, kg (lb)
Front wheels	Nil	Nil	Nil
Rear wheels	32	1521 (3353)	881 (1942)
Additional	10	386 (851)	Front frame weights

Track setting during tests

Front - 1610 mm (63.4 in)

Rear - 1726 mm (68.0 in)

FUEL AND LUBRICANTS USED IN TESTS

Fuel

Laboratory tests: Diesel oil to Class A British Standard 2869:1970, specific gravity 0.848 at 15°C (59°F), viscosity 2.43 cSt at 50°C (122°F), Cetane No. 56

Track tests: Diesel oil to Class D British Standard 2869:1970, specific gravity 0.850 at 15°C (59°F), viscosity 2.64 cSt at 50°C (122°F), Cetane No. 53

Oil

Engine and transmission: Agricastrol M.P., S.A.E. 20W/30, viscosity 54 cSt at 50°C (122°F)

Final drives: Mobilube GX,S.A.E. 90, viscosity 115 cSt at 50°C (122°F)

COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 28th October 1980, NIAE, Silsoe, Bedford, UK

Type of dynamometer: Water brake, Heenan and Froude

Power,	Speed, rev/min		Fuel consumption,			
kW (hp)	Engine	P.t.o.	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test						
61.6 (82.6)	2000	1182	19.31 (4.25)	16.37 (36.10)	0.266 (0.437)	3.19 (19.4)
The speed recommended by the manufacturer for drawbar work						
61.6 (82.6)	2000	1182	19.31 (4.25)	16.37 (36.10)	0.266 (0.437)	3.19 (19.4)
Part loads						
(1) 85% of the torque obtained at maximum power						
53.9 (72.3)	2060	1217	16.91 (3.72)	14.34 (31.62)	0.266 (0.437)	3.19 (19.4)
(2) Unloaded						
0	2191	1295	5.68 (1.24)	4.82 (10.62)	-	-
(3) 50% of the torque defined in (1)						
27.8 (37.3)	2117	1251	11.02 (2.43)	9.35 (20.61)	0.336 (0.553)	2.52 (15.4)
(4) Maximum power						
61.6 (82.6)	2000	1182	19.31 (4.25)	16.37 (36.10)	0.266 (0.437)	3.19 (19.4)
(5) 25% of the torque defined in (1)						
14.0 (18.8)	2147	1269	8.01 (1.76)	6.79 (14.97)	0.485 (0.797)	1.75 (10.7)
(6) 75% of the torque defined in (1)						
41.1 (55.1)	2090	1235	13.98 (3.08)	11.86 (26.14)	0.289 (0.475)	2.94 (17.9)

Power, kW (hp)	Speed, rev/min		Fuel consumption,			
	Engine	P.t.o.	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Part loads, the governor hand lever in the position corresponding to the standard p.t.o. speed at full load (1000 rev/min).						
(1) 85% of the torque obtained at maximum power						
50.3 (67.5)	1747	1033	14.67 (3.23)	12.44 (27.42)	0.247 (0.406)	3.43 (20.9)
(2) Unloaded						
0	1937	1145	4.52 (1.00)	3.83 (8.44)	-	-
(3) 50% of the torque defined in (1)						
26.4 (35.4)	1835	1085	9.16 (2.02)	7.77 (17.12)	0.295 (0.484)	2.88 (17.5)
(4) Maximum power						
57.3 (76.8)	1692	1000	16.78 (3.69)	14.23 (31.37)	0.248 (0.408)	3.41 (20.8)
(5) 25% of the torque defined in (1)						
13.5 (18.1)	1880	1111	6.82 (1.50)	5.78 (12.74)	0.428 (0.704)	1.98 (12.1)
(6) 75% of the torque defined in (1)						
38.6 (51.8)	1792	1059	11.85 (2.61)	10.05 (22.16)	0.260 (0.428)	3.26 (19.9)

Standard specific fuel consumption, kg/kWh (lb/hph)

(a) 0.266 (0.437) (b) 0.336 (0.553) (c) 0.247 (0.406) (d) 0.295 (0.484)

No load, maximum engine speed 2191 rev/min

Equivalent crankshaft torque at maximum power 294.1 Nm (216.9 lb ft)

Maximum equivalent crankshaft torque 343.0 Nm (253.0 lb ft) at 1180 rev/min engine speed

Mean atmospheric conditions temperature 17°C (63°F)

pressure 1007 m bar (29.74 in Hg)

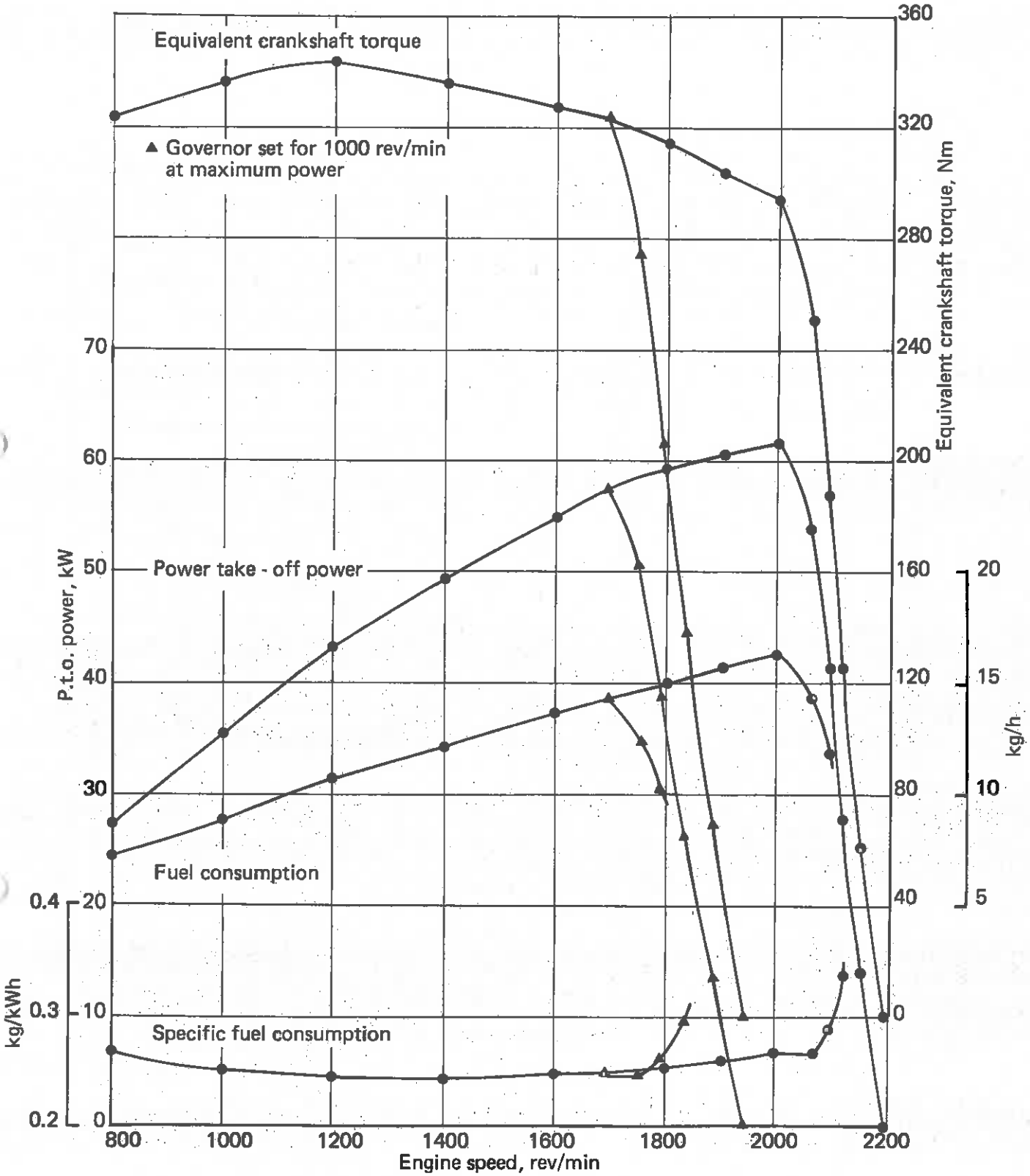
relative humidity 81 %

Maximum temperature coolant 85°C (185°F)

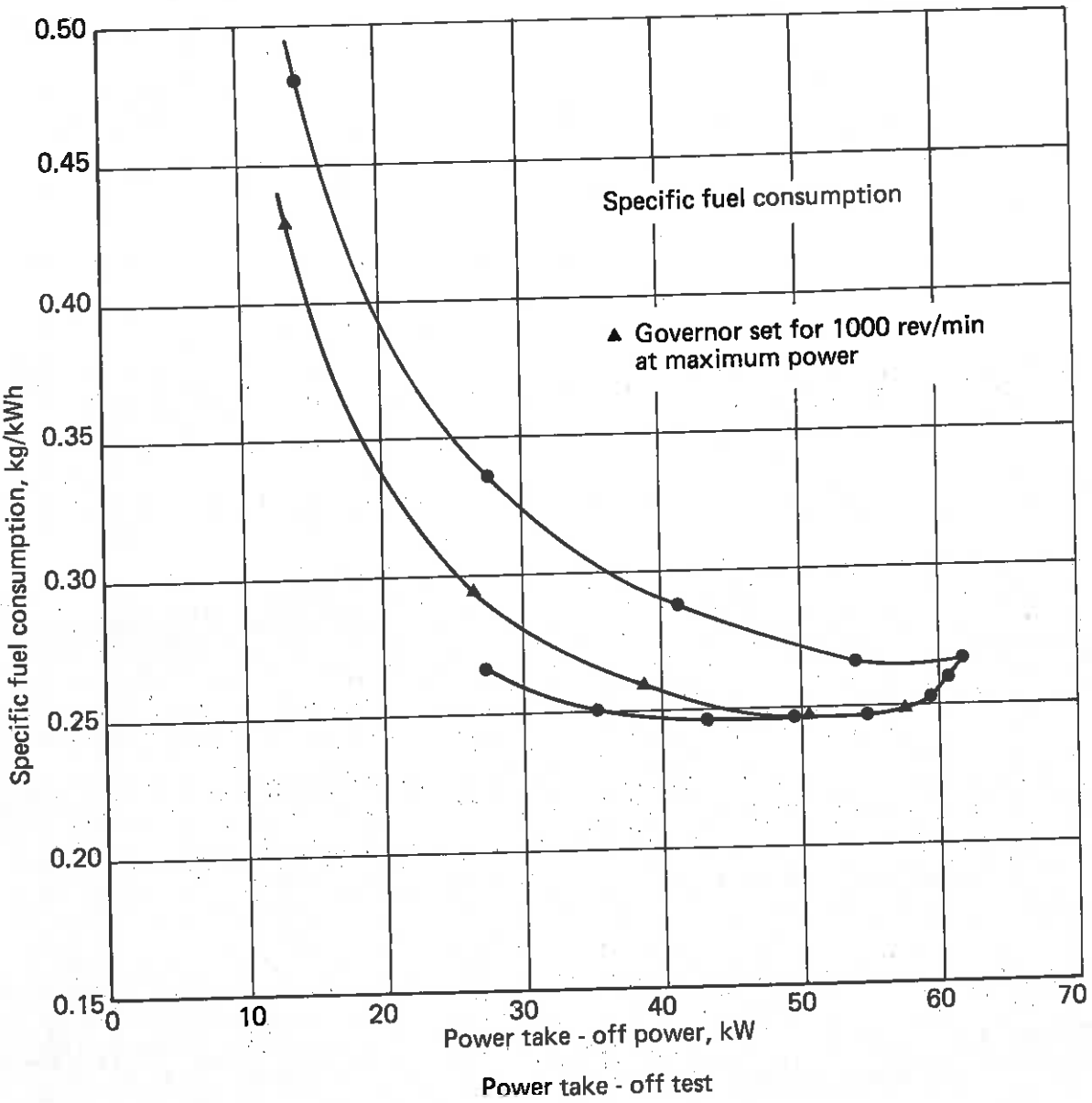
engine oil 99°C (210°F)

fuel 31°C (88°F)

air intake 26°C (79°F)



Power take - off test



Power take - off test

2 DRAWBAR PERFORMANCE

Date of tests: March-April 1981 Height of drawbar above ground: Unballasted: 470 mm (18.5 in)
Type of track: Concrete Ballasted: 445 mm (17.5 in)

Gear	Speed, km/h (mile/h)	Power, kW (hp)	Drawbar pull, kN (lb)	Engine speed, rev/min	Wheel-slip, %	Specific fuel consumption, kg/kWh (lb/hph)	kWh/l (hph/UKgal)	Temperature, °C (°F) Fuel	Coolant	Engine oil	Atmospheric conditions Temperature, °C (°F)	Relative humidity, %	Pressure, m bar (in Hg)
(i) MAXIMUM POWER (unballasted) Tyre inflation pressure: front 165 kPa (24 lb/in^2), rear 83 kPa (12 lb/in^2)													
L3 low	4.69 (2.91)	*35.2 (47.2)	27.0 (6070)	2087	15.0	-	-	25 (77)	83 (181)	90 (194)	9 (48)	88	1030 (30.42)
L3 high	5.97 (3.71)	*44.8 (60.1)	27.0 (6070)	2059	15.0	-	-	24 (75)	83 (181)	90 (194)	9 (48)	88	1030 (30.42)
H1 low	6.70 (4.16)	50.1 (67.2)	26.9 (6050)	1996	14.9	-	-	23 (73)	83 (181)	90 (194)	9 (48)	88	1030 (30.42)
H1 high	9.20 (5.72)	53.9 (72.3)	21.1 (4740)	1997	8.8	-	-	21 (70)	83 (181)	91 (196)	9 (48)	88	1030 (30.42)
H2 low	11.07 (6.88)	54.1 (72.5)	17.6 (3960)	2003	6.8	-	-	18 (64)	82 (180)	87 (189)	9 (48)	88	1030 (30.42)
H2 high	14.35 (8.92)	53.4 (71.6)	13.4 (3010)	2001	4.9	-	-	15 (59)	83 (181)	86 (187)	9 (48)	88	1030 (30.42)
(ii) MAXIMUM POWER (ballasted) Tyre inflation pressure: front 317 kPa (46 lb/in^2), rear 110 kPa (16 lb/in^2)													
L1 low	1.71 (1.06)	*23.0 (30.8)	48.4 (10880)	2116	15.0	0.417 (0.686)	2.06 (12.6)	22 (72)	84 (183)	88 (190)	12 (54)	68	1001 (29.56)
L1 high	2.16 (1.34)	*29.0 (38.9)	48.4 (10880)	2101	15.0	0.374 (0.615)	2.30 (14.0)	20 (68)	83 (181)	89 (192)	11 (52)	66	1001 (29.56)
L2 low	2.53 (1.57)	*34.0 (45.6)	48.4 (10880)	2087	15.0	0.353 (0.580)	2.43 (14.8)	23 (73)	85 (185)	91 (196)	12 (54)	68	1001 (29.56)
L2 high	3.18 (1.98)	*42.8 (57.4)	48.4 (10880)	2056	15.0	0.332 (0.546)	2.56 (15.6)	21 (70)	85 (185)	92 (198)	11 (52)	66	1001 (29.56)
L3 low	4.66 (2.90)	51.4 (68.9)	39.7 (8920)	2006	11.2	0.312 (0.513)	2.72 (16.6)	24 (75)	86 (187)	93 (199)	11 (52)	66	1001 (29.56)
L3 high	6.15 (3.82)	53.1 (71.2)	31.1 (6990)	2005	8.5	0.309 (0.508)	2.75 (16.8)	26 (79)	85 (185)	94 (201)	12 (54)	68	1001 (29.56)
H1 low	7.25 (4.51)	53.4 (71.6)	26.5 (5960)	2002	7.0	0.307 (0.505)	2.77 (16.9)	24 (75)	84 (183)	91 (196)	12 (54)	68	1001 (29.56)
H1 high	9.42 (5.85)	53.1 (71.2)	20.3 (4560)	2002	5.5	0.314 (0.516)	2.71 (16.5)	26 (79)	84 (183)	93 (199)	12 (54)	68	1001 (29.56)
H2 low	11.16 (6.93)	53.3 (71.5)	17.2 (3870)	1999	4.6	0.312 (0.513)	2.73 (16.6)	29 (84)	85 (185)	94 (201)	11 (52)	66	1001 (29.56)
H2 high	14.32 (8.90)	51.3 (68.8)	12.9 (2900)	2002	3.5	0.322 (0.529)	2.64 (16.1)	30 (86)	84 (183)	94 (201)	10 (50)	65	1001 (29.56)
(iii) FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
H1 low	7.56 (4.70)	41.8 (56.1)	19.9 (4470)	2056	5.2	0.301 (0.495)	2.86 (17.4)	28 (82)	84 (183)	92 (198)	11 (52)	89	1018 (30.06)
(iv) FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST (ii)													
L2 high	3.30 (2.05)	-	48.4 (10880)	-	-	-	-	30 (86)	84 (183)	94 (201)	9 (48)	87	1023 (30.21)

Total oil consumption during ten hours duration of tests (iii) and (iv) 32.8 g/h (0.072 lb/h)

*Maximum power available at 15% wheelslip

+Test (iv) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance.

3. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification, without ballast

Track of wheels: front - 1610 mm (63.4 in)
rear - 1726 mm (68.0 in)

	With brakes		Without brakes	
	Left-hand	Right-hand	Left-hand	Right-hand
Radius of turning space, m (in)	4.24 (167)	4.17 (164)	5.10 (201)	4.97 (196)
Radius of turning circle, m (in)	4.14 (163)	4.07 (160)	5.00 (197)	4.87 (192)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm (in)	845 (33.3)
Distance forward from the vertical plane containing the axis of the rear wheels, mm (in)	887 (34.9)
Distance from the median plane of the tractor, mm (in)	0

5. BRAKING

Date of tests: 15th April - 14th May 1981

Type of track: Concrete

Masses during brake tests

	Front, kg (lb)	Rear, kg (lb)	Total, kg (lb)
Ballasted	1874 (4131)	5074 (11186)	6948 (15317)
Unballasted	1191 (2626)	2029 (4473)	3220 (7099)

Type 0 Service brakes (cold)

Travelling speed before application of brakes, ballasted 28.1 km/h (17.5 mile/h)
unballasted 29.8 km/h (18.5 mile/h)

Ballasted	Force on brake pedal	N (lb)	100 (22)	200 (45)	300 (67)	400 (90)	500 (112)	600 (135)	650 (146)
	Mean deceleration	m/s^2 (ft/s^2)	0.9 (3.0)	1.5 (4.9)	2.1 (6.9)	2.7 (8.9)	3.3 (10.8)	4.0 (13.1)	4.3 (14.1)
Unballasted	Force on brake pedal	N (lb)	100 (22)	125 (28)	150 (34)	175 (39)	200 (45)	220 (49)	240 (54)
	Mean deceleration	m/s^2 (ft/s^2)	0.5 (1.6)	1.2 (3.9)	1.8 (5.9)	2.5 (8.2)	3.2 (10.5)	3.7 (12.1)	4.3 (14.1)

Type 1 Service brakes (hot)

Ballasted	Force on brake pedal	N (lb)	100 (22)	200 (45)	300 (67)	400 (90)	500 (112)	570 (128)	
	Mean deceleration	m/s^2 (ft/s^2)	0.4 (1.3)	1.2 (3.9)	2.0 (6.6)	2.9 (9.5)	3.7 (12.1)	4.3 (14.1)	

Brakes were heated by: The cycle of 20 brake applications

Comments on deviation and vibration: None

Parking brake

		Force applied on slope of 18%		Force applied on slope of 12% with trailer of 3.0 tonnes (6614lb)	
		Up	Down	Up	Down
Pull on handbrake	N (lb)	400 (90)	400 (90)	400 (90)	400 (90)

6. MEASUREMENT OF EXTERNAL NOISE LEVEL

Date of tests:	5th June 1981
Type of sound level meter:	Bruel and Kjaer 2209
Type of track:	Concrete
Results of tests:	
Gear:	H3 high
Travelling speed before acceleration:	22.1 km/h (13.7 mile/h)
Sound level:	87 dBA

7. NOISE MEASUREMENT AT THE DRIVER'S EAR

Date of tests: 5th June 1981
Type of sound level meter: Bruel and Kjaer 2209
Type of track: Concrete
Cab fitted: No

Results of tests

Gear	Drawbar pull at which the tractor develops maximum sound level, kN (lb)	Measured travelling speed, km/h (mile/h)	Sound level, dBA
No cab fitted			
*H1 low	22.0 (4950)	7.4 (4.6)	94
*H1 low	Light load	8.4 (5.2)	93
L2 high	27.0 (6070)	3.4 (2.1)	96
L3 high	27.0 (6070)	6.0 (3.7)	95
H2 low	15.0 (3370)	11.4 (7.1)	95
H3 high	Light load	29.5 (18.3)	95

*The H1 low gear corresponds to the nominal travelling speed nearest to 7.5 km/h (4.7 mile/h).

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests: 20th May and 2nd June 1981
Hydraulic fluid:
Make and type: Agricastrol M.P. S.A.E. 20W/30
Viscosity: 54 cSt at 50°C (122°F)

Type of linkage lock for transport: Hydraulic

Power lift

	Height of lower hitch point above ground in down position, mm (in)	Vertical movement, mm (in)	Maximum force exerted through full range, kN (lb)	Corresponding pressure of hydraulic fluid, kPa (lb/in^2)	Moment about rear axle, kNm (lb ft)	Maximum tilt angle of mast over range of lift, degrees
At the hitch points	325 (12.8)	626 (24.6)	28.7 (6450)	19.3 (2800)	27.9 (20578)	-
On the frame	325 (12.8)	788 (31.0)	21.1 (4740)	19.3 (2800)	33.4 (24635)	13.2

Hydraulic pump performance

Opening pressure of the relief valve:	19.0 MPa (2760 lb/in^2)
Sustained pressure with relief valve open:	22.0 MPa (3190 lb/in^2)
Opening pressure of the unloading valve:	Not applicable
Closing pressure of the unloading valve:	Not applicable
Pump delivery rate at minimum pressure, the governor control lever set for maximum power:	31.6 l/min (7.0 gal/min)
Hydraulic power at 19.0 MPa (2760 lb/in^2):	9.9 kW (13.3 hp)
Pressure specified by the manufacturer for an external hydraulic motor:	19.0 MPa (2760 lb/in^2)
Tapping point:	From valve block
Pump delivery rate at stated power:	31.3 l/min (6.9 gal/min)
Temperature of hydraulic fluid:	67°C (153°F)

Linkage geometry when connected to the standard frame, mm (in)

Projected length in side view		
Lower links	1005	(39.6)
Lift arms	225	(8.9)
Lift rods	695	(27.4)
Top link	783	(30.8)
Distance of lift rod connection point from pivot point of lower link	567	(22.3)

The following dimensions are given relative to the rear wheel centre line, situated 770 mm (30.3 in) above the ground level		
Lower link pivot point	32 (1.3) forward,	212 (8.3) below
Top link pivot point	201 (7.9) behind,	169 (6.7) above
Lift arm pivot point	196 (7.7) forward,	233 (9.2) above
Maximum and minimum height of lower link hitch points	181 (7.1) above,	445 (17.5) below
Height of lower link hitch points when locked in transport position	Any height within lift range	

OPTIONAL TESTS

9. PERFORMANCE AT ENGINE CRANKSHAFT

Date and location of tests: 21st October 1980, NIAE, Silsoe, Bedford, UK.

Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Speed, rev/min	Fuel consumption, 1/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test					
65.0 (87.1)	2000	19.09 (4.20)	16.19 (35.69)	0.249 (0.410)	3.40 (20.7)
The speed recommended by the manufacturer for drawbar work					
65.0 (87.1)	2000	19.09 (4.20)	16.19 (35.69)	0.249 (0.410)	3.40 (20.7)
Part loads					
(1) 85% of the torque obtained at maximum power					
56.5 (75.7)	2045	16.67 (3.67)	14.14 (31.17)	0.250 (0.412)	3.39 (20.6)
(2) Unloaded					
0	2180	5.33 (1.17)	4.52 (9.96)	-	-
(3) 50% of the torque defined in (1)					
29.0 (38.9)	2104	10.55 (2.32)	8.94 (19.72)	0.308 (0.506)	2.75 (16.8)
(4) Maximum power					
65.0 (87.1)	2000	19.09 (4.20)	16.19 (35.69)	0.249 (0.410)	3.40 (20.7)
(5) 25% of the torque defined in (1)					
14.7 (19.7)	2133	7.64 (1.68)	6.47 (14.27)	0.440 (0.723)	1.93 (11.8)
(6) 75% of the torque defined in (1)					
43.0 (57.7)	2077	13.62 (3.00)	11.55 (25.46)	0.269 (0.442)	3.16 (19.2)

No load, maximum engine speed 2180 rev/min

Crankshaft torque at maximum power 310.2 Nm (228.8 lb ft)

Maximum crankshaft torque 354.0 Nm (261.1 lb ft) at 1180 rev/min engine speed

Mean atmospheric conditions temperature 17°C (63°F)

pressure 1013 m bar (29.91 in Hg)

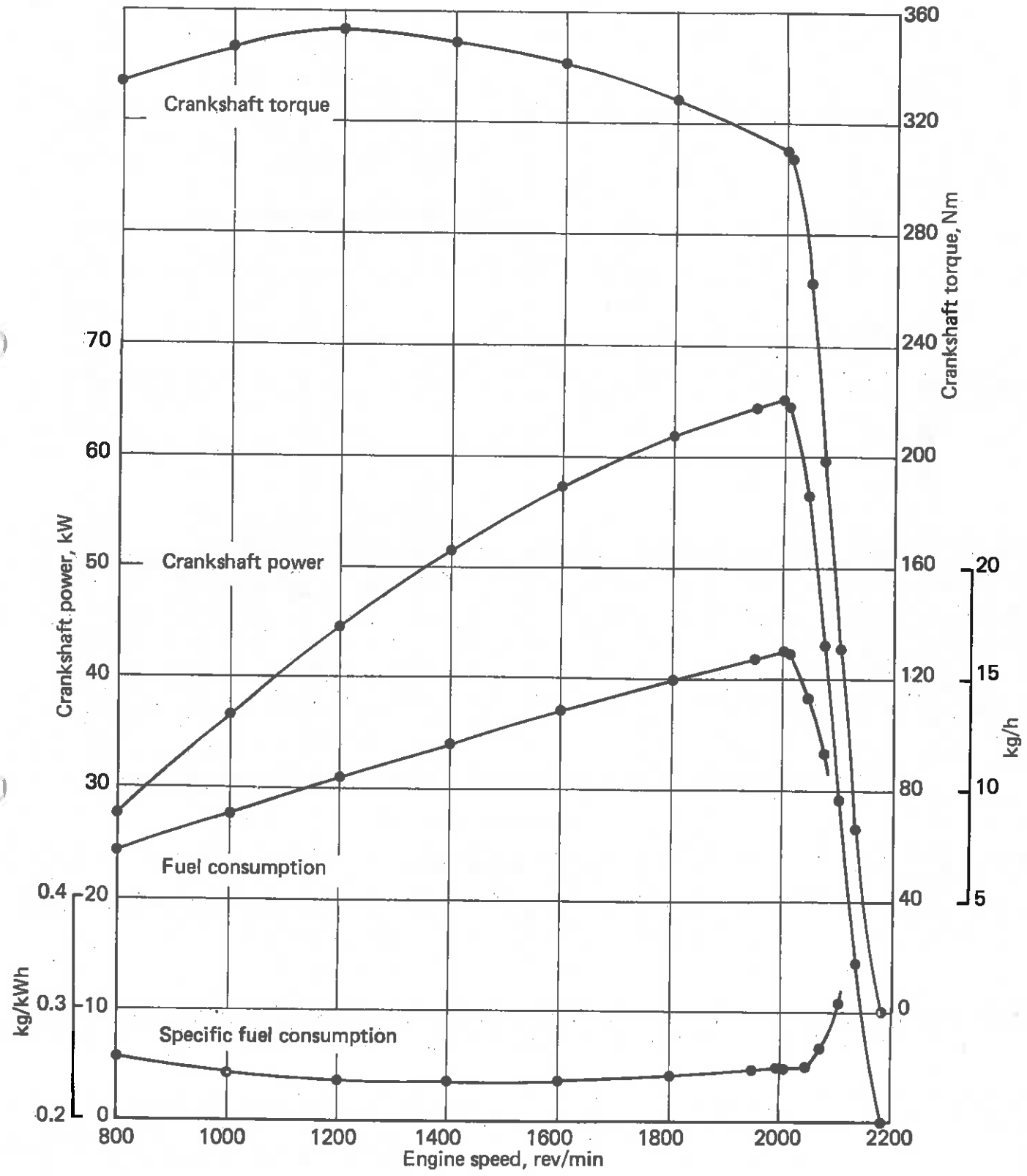
relative humidity 64 %

Maximum temperature coolant 86°C (187°F)

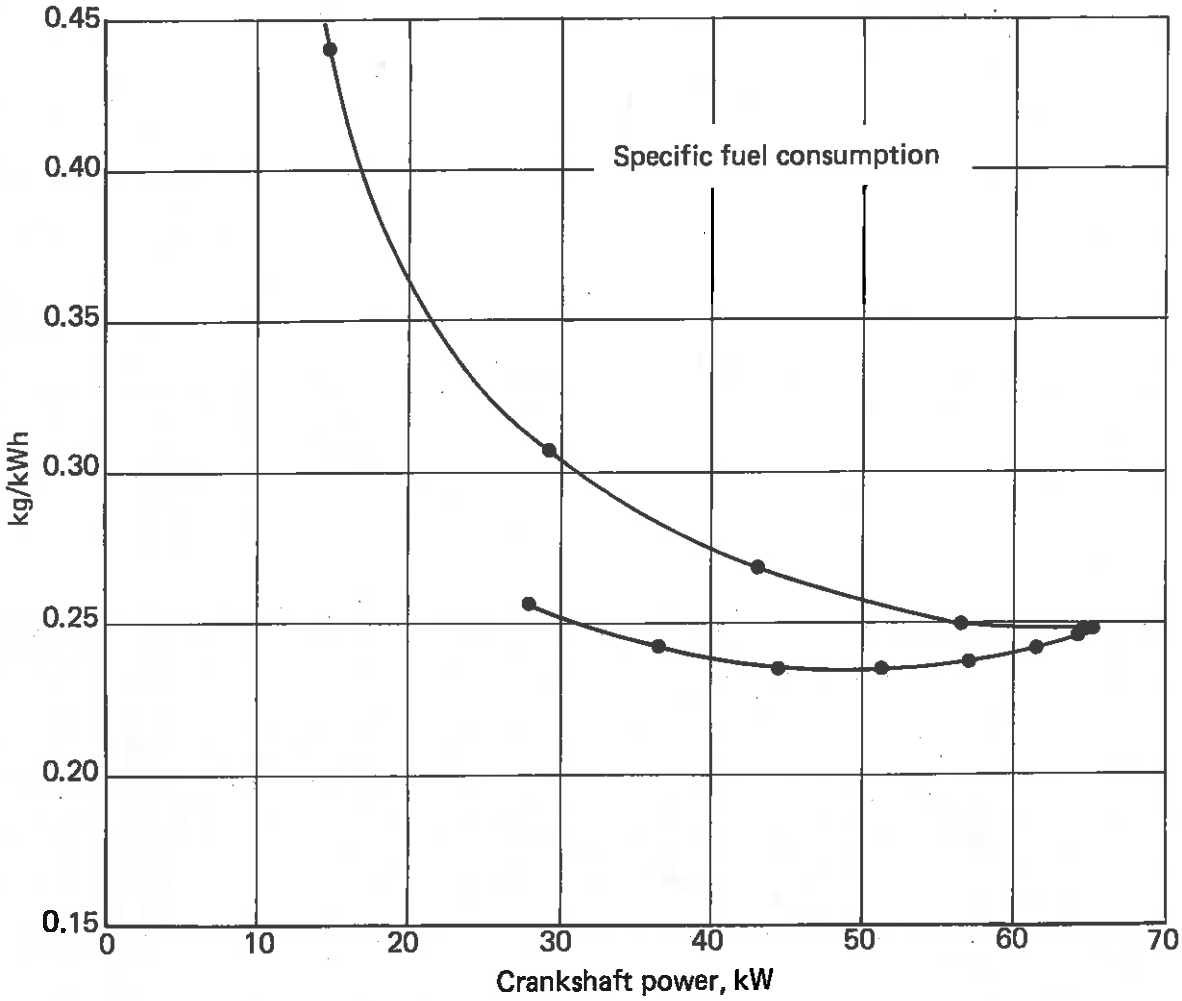
engine oil 98°C (208°F)

fuel 35°C (95°F)

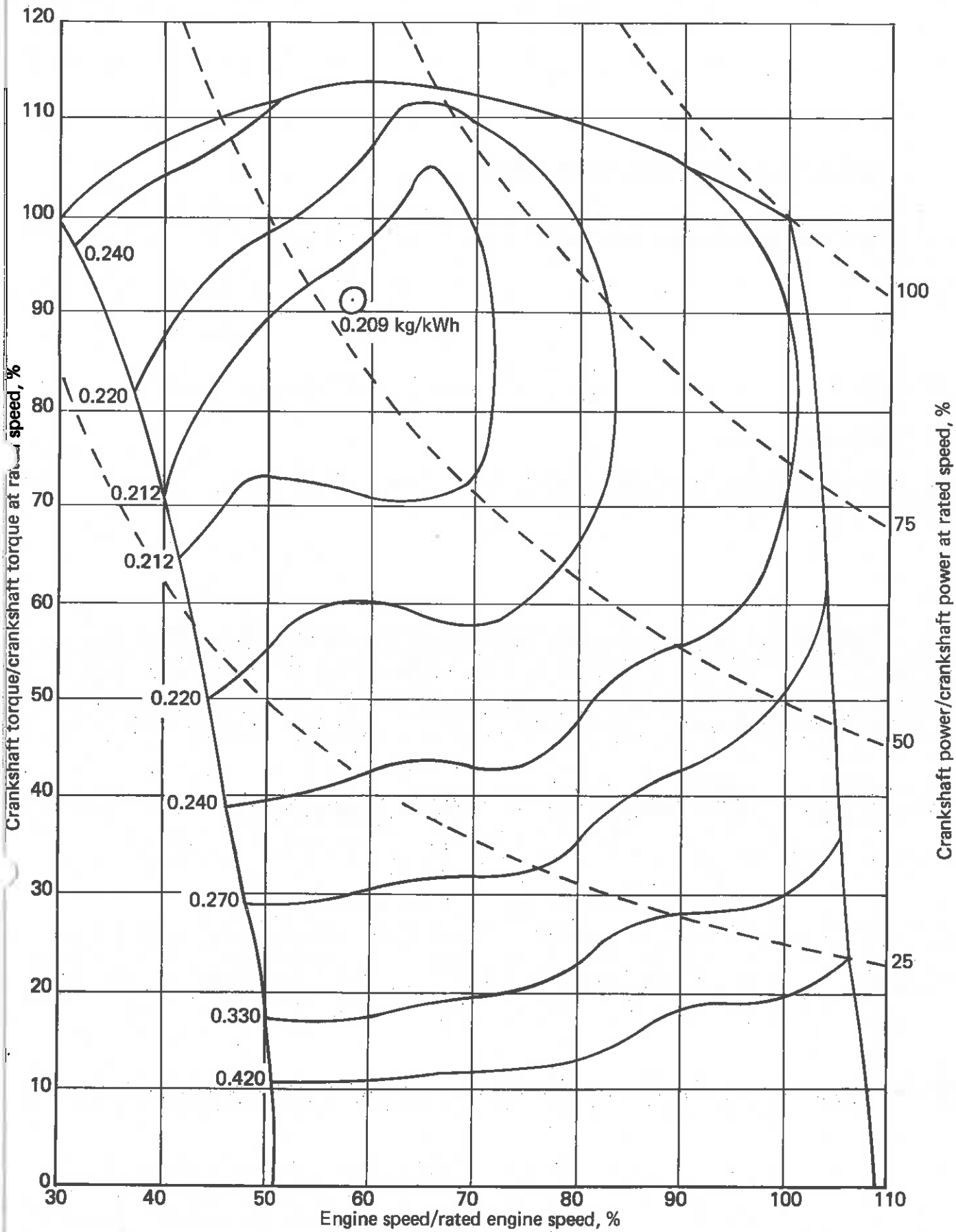
air intake 25°C (77°F)


Crankshaft torque
Crankshaft power
Fuel consumption
Specific fuel consumption
Crankshaft power, kW
Crankshaft torque, Nm
kg/kWh
kg/h
Engine speed, rev/min
70
60
50
40
30
360
320
280
240
200
160
120
80
40
0
20
15
10
5
0.4
0.3
0.2
20
10
0
800
1000
1200
1400
1600
1800
2000
2200

Engine test


Specific fuel consumption
kg/kWh
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0
10
20
30
40
50
60
70
Crankshaft power, kW

Engine test



Engine test, specific fuel consumption

REPAIRS AND ADJUSTMENTS DURING TESTS:

Punctures occurred in both driving wheel tyres due to movement on the rims during the track tests.

REMARKS: None

Test carried out by: F. Thistlethwaite, P.C. Seward, J.P. Evans

Officer in charge: D.W. Smith

Signed: Head of Tractor Department

for the Director

Date: 14/9/81